DETAILED ACTION

1. This action is in response to the communication filed 7/19/2010. Upon further consideration the previous indication of allowability with regard to the claims is withdrawn in view of the rejection found below.

Claim Objections

2. Claims 3, 5, and 19 are objected to because of the following informalities:

3. As to Claim 3,

4. The phrase "the other of the center lines" on the third to last line lacks antecedent basis.

5. The phrase "the magnetization direction of the pinned layer and a magnetization direction of the free layer" on the last two lines of the middle paragraph lack antecedent basis.

6. As to claim 5,

7. The phrase "of the left side and the right side" on line two of (a) is awkward in that it appears it should be of the "top side and the "bottom side."

8. The phrase "of the top side and the bottom side" on line two of (f) is awkward in that it appears it should be "of the left side and the right side."

9. As to Claim 19,

10. This claim stands objected to for similar reasons as noted in the above objection of claim 3.

11. Appropriate correction is required.

Claim Rejections - 35 USC § 103

12. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

13. Claims 3, 5, 6, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adelerhof et al. (Adelerhof) (WO 0079298) in view of Van Delden et al. (Van Delden)(US 6,100,686).

14. As to Claim 3,

15. Adelerhof discloses a plurality of magnetoresistance effect elements, four of the plurality of magnetoresistance effect elements coupled to include a single axis magnetic sensor by full bridge connection of the four elements (Figure 6), the single axis magnetic sensor being an X-axis magnetic sensor for detecting a magnetic field along an X-axis or a Y-axis magnetic sensor for detecting a magnetic field along a Y-axis (Figure 6), each of the plurality of magnetoresistance effect elements including a spin value film, the spin valve film including a free layer, a spacer layer, and a pinned layer whose magnetization direction is pinned, the pinned magnetization

direction of the pinned layers of the four elements being parallel to each other, the layers are successively laminated on a substrate of a single chip, each of the plurality of magnetoresistance effect elements having a resistance value that changes in accordance with a relative angle formed by the magnetization direction of the pinned layer and a magnetization direction of the free layer, and the pinned layers of at least two of the plurality of magnetoresistance effect elements have pinned magnetization directions that cross each other ((Figure 6) and (Page 1, Lines 9-26) and (Page 19, Lines 3-21)).

16. Adelerhof does not disclose the substrate having a rectangular shape which has two sides along the X-axis and two sides along the Y-axis, the X-axis and the Y-axis being perpendicular to each other in a plan view, wherein the magnetic sensor is formed such that the plurality of magnetoresistance effect elements are provided on a single plane, the magnetoresistance effect elements are placed symmetrically with respect to center lines of the rectangular shape, one of the center lines is a center line of the two sides along the X-axis and perpendicular to the Y-axis, and the other of the center lines is a center line of the two sides along the Y-axis and perpendicular to the X-axis.

17. Van Delden discloses the substrate having a rectangular shape which has two sides along the X-axis and two sides along the Y-axis, the X-axis and the Y-axis being perpendicular to each other in a plan view, wherein the magnetic sensor is formed such that the plurality of magnetoresistance effect elements are provided on a single plane, the magnetoresistance effect elements are placed symmetrically with respect to center lines of the rectangular shape, one of the center lines is a center line of the two sides along the X-axis and perpendicular to the Y-axis, and the other of the center lines is a center line of the two sides along the Y-axis and perpendicular to the X-axis ((Figure 2) and (Column 5, Lines 16-22)).

18. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Adelerhof to include the substrate having a rectangular shape which has two sides along the X-axis and two sides along the Y-axis, the X-axis and the Y-axis being perpendicular to each other in a plan view, wherein the magnetic sensor is formed such that the plurality of magnetoresistance effect elements are provided on a single plane, the magnetoresistance effect elements are placed symmetrically with respect to center lines of the rectangular shape, one of the center lines is a center line of the two sides along the X-axis and perpendicular to the Y-axis, and the other

of the center lines is a center line of the two sides along the Y-axis and perpendicular to the X-axis as taught by Van Delden in order to nest the Wheatstone bridges so they occupy as little space as possible (Column 5, Lines 16-22).

19. As to Claim 5,

20. Adelerhof discloses eight magnetoresistance effect elements including a first through an eighth element, each of the elements including a spin valve film, the film including a free layer and a spacer layer and a pinned layer, the pinned layer having a pinned magnetization direction, wherein the layers are successively laminated on a substrate of a single chip, each of the elements has a resistance value that changes in accordance with a relative angle formed by a magnetization direction of the pinned layer and a magnetization direction of the free layer, in which four of the elements form a Y-axis Wheatstone bridge sensor with two elements of the Y-axis bridge having pinned magnetization directions in the positive Y-axis, and two elements of the Y-axis bridge having pinned magnetization directions in the negative Y-axis, and a four of the elements forming an X-axis Wheatstone bridge with two of the elements having a pinned magnetization direction in the positive X-axis direction, and two of the elements of the X-axis bridge having

pinned magnetization directions in the negative X-axis direction ((Figure 6) and (Page 1, Lines 9-26) and (Page 19, Lines 3-21)).

21. Adelerhof does not disclose the substrate having a rectangular shape which has a left side along a Y-axis, a right side along the Y-axis, a top side along an X-axis, and a bottom side along the X-axis in a plan view, the X-axis and the Y-axis are perpendicular to each other, and the magnetic sensor being formed in such a manner that the magnetoresistance effect elements are provided on a single plane,

said magnetic sensor being formed in such a manner that said magnetoresistance effect elements are provided on a single plane,

(a) said first element being formed at a position closer to the left side than the right side and below a first center line of the left side and the right side, the first center line being perpendicular to the Y-axis, and said first element, having a pinned magnetization direction of said first element's pinned layer in a direction of the X-axis;

(b) said second element being formed at a position closer to the left side than the right side and above the first center line, and said second element having a pinned magnetization direction of said second element's pinned layer in the direction of the X-axis;

(c) said third element being formed at a position closer to the right side than the left side and above the first center line, and said third element having a pinned magnetization direction of said third element's pinned layer in the direction of the X-axis;

(d) said fourth element being formed at a position closer to the right side than the left side and below the first center line, and said fourth element having a pinned magnetization direction of said fourth element's pinned layer in the direction of the X-axis;

(e) [[(a)]] said first to fourth elements construct an X-axis magnetic sensor for detecting a magnetic field in the direction of the X-axis by full bridge connection of the first to fourth elements; [[and]]

(f) said fifth element being formed at a position closer to the top side than the bottom side and left of a second center line of the top side and the bottom side, the second center

line being perpendicular to the X-axis, and said fifth element having a pinned magnetization direction of said fifth element's pinned layer in the direction of the Y-axis;

(g) said sixth element being formed at a position closer to the top side than the bottom side and right of the second center line, and said sixth element having a pinned magnetization direction of said sixth element's pinned layer in the direction of the Y-axis;

(h) said seventh element being formed at a position closer to the bottom side than the top side and right of the second center line, and said seventh element having a pinned magnetization direction of said seventh element's pinned layer in the direction of the Y-axis; and

(i) said eighth element being formed at a position closer to the bottom side than the top side and left of the second center line, and said eighth element having a pinned magnetization direction of said eighth element's pinned layer in the direction of the Y-axis; and

(j) [[(b)]] said fifth to eighth elements construct a Y-axis magnetic sensor for detecting a magnetic field in the direction of the Y-axis by full bridge connection of the fifth to eighth elements.

and

(a) the pinned magnetization direction of the pinned layer of the first and the second elements are in a negative direction of the X-axis;

(b) the pinned magnetization direction of the pinned layer of the third and the fourth elements are in a positive direction of the X-axis;

(c) the pinned magnetization direction of the pinned layer of the fifth and the sixth elements are in a positive direction of the Y-axis; and

(d) the pinned magnetization direction of the pinned layer of the seventh and the eighth elements are in a negative direction of the Y-axis.

22. Van Delden discloses the substrate having a rectangular shape which has two sides along the X-axis and two sides along the Y-axis, the X-axis and the Y-axis being perpendicular to each other in a plan view, wherein the magnetic sensor is formed such that the plurality of magnetoresistance effect elements are provided on a single plane, the magnetoresistance effect

elements are placed symmetrically with respect to center lines of the rectangular shape, one of the center lines is a center line of the two sides along the X-axis and perpendicular to the Y-axis, and the other of the center lines is a center line of the two sides along the Y-axis and perpendicular to the X-axis ((Figure 2) and (Column 5, Lines 16-22)).

23. It would have been obvious to a person of ordinary skill in the art at the time of invention to modify Adelerhof to place the elements of the two bridges of Adelerhof in a nested configuration as taught by Van Delden, to therefore include the substrate having a rectangular shape which has a left side along a Y-axis, a right side along the Y-axis, a top side along an X-axis, and a bottom side along the X-axis in a plan view, the X-axis and the Y-axis are perpendicular to each other, and the magnetic sensor being formed in such a manner that the magnetoresistance effect elements are provided on a single plane,

said magnetic sensor being formed in such a manner that said magnetoresistance effect elements are provided on a single plane,

(a) said first element being formed at a position closer to the left side than the right side and below a first center line of the left side and the right side, the first center line being perpendicular to the Y-axis, and said first element, having a pinned magnetization direction of said first element's pinned layer in a direction of the X-axis;

(b) said second element being formed at a position closer to the left side than the right side and above the first center line, and said second element having a pinned magnetization direction of said second element's pinned layer in the direction of the X-axis;

(c) said third element being formed at a position closer to the right side than the left side and above the first center line, and said third element having a pinned magnetization direction of said third element's pinned layer in the direction of the X-axis;

(d) said fourth element being formed at a position closer to the right side than the left side and below the first center line, and said fourth element having a pinned magnetization direction of said fourth element's pinned layer in the direction of the X-axis;

(e) [[(a)]] said first to fourth elements construct an X-axis magnetic sensor for detecting a magnetic field in the direction of the X-axis by full bridge connection of the first to fourth elements; [[and]]

(f) said fifth element being formed at a position closer to the top side than the bottom side and left of a second center line of the top side and the bottom side, the second center

line being perpendicular to the X-axis, and said fifth element having a pinned magnetization direction of said fifth element's pinned layer in the direction of the Y-axis;

(g) said sixth element being formed at a position closer to the top side than the bottom side and right of the second center line, and said sixth element having a pinned magnetization direction of said sixth element's pinned layer in the direction of the Y-axis;

(h) said seventh element being formed at a position closer to the bottom side than the top side and right of the second center line, and said seventh element having a pinned magnetization direction of said seventh element's pinned layer in the direction of the Y-axis; and

(i) said eighth element being formed at a position closer to the bottom side than the top side and left of the second center line, and said eighth element having a pinned magnetization direction of said eighth element's pinned layer in the direction of the Y-axis; and

(j) [[(b)]] said fifth to eighth elements construct a Y-axis magnetic sensor for detecting a magnetic field in the direction of the Y-axis by full bridge connection of the fifth to eighth elements.

and

(a) the pinned magnetization direction of the pinned layer of the first and the second elements are in a negative direction of the X-axis;

(b) the pinned magnetization direction of the pinned layer of the third and the fourth elements are in a positive direction of the X-axis;

(c) the pinned magnetization direction of the pinned layer of the fifth and the sixth elements are in a positive direction of the Y-axis; and

(d) the pinned magnetization direction of the pinned layer of the seventh and the eighth elements are in a negative direction of the Y-axis.

given the above disclosure and teaching of Van Delden in order to nest the Wheatstone bridges so they occupy as little space as possible (Column 5, Lines 16-22).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID M.

SCHINDLER whose telephone number is (571)272-2112. The examiner can normally be reached on Monday-Friday (8:00AM-4:30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on (571) 272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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